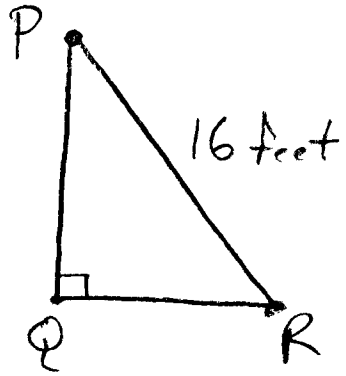
Alg. 2 BE | Tuesday | 5-1-12

ACT "REAL" ① The hypotenuse of the right triangle $\triangle PQR$ is 16 feet. The sine of $\angle P$ is $\frac{3}{5}$. Find $\overline{QR}$.



ANS

$$\sin = \frac{O}{H} = \frac{\overline{QR}}{16} = \frac{3}{5}$$

$$\therefore \overline{QR} = \frac{3}{5} \cdot 16$$

$$\boxed{\overline{QR} = \frac{48}{5} = 9.6 \text{ ft}}$$

Alg. 2 Homework Review Pg 549 #4-7, 9-11

④ $\log 4 = \boxed{0.6021}$ ⑤ $\log 23 = \boxed{1.3617}$

⑥ $\log 0.5 = -0.3010$

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⑦ $9^x = 45$ $\therefore \log 9^x = \log 45$

$x \log 9 = \log 45$

$x = \frac{\log 45}{\log 9} = \frac{1.65321}{0.95424}$

CK $9^{1.7325} \stackrel{?}{=} 45$

$45.001 \stackrel{?}{=} 45$ ✓ $\boxed{x = 1.7325}$

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⑨ $3.1^{a-3} = 9.42$ $\therefore \log 3.1^{a-3} = \log 9.42$

$(a-3) \log 3.1 = \log 9.42$

$a - 3 = \frac{\log 9.42}{\log 3.1}$

CK $3.1^{4.9824-3} \stackrel{?}{=} 9.42$

$3.1^{1.9824} \stackrel{?}{=} 9.42$

$9.4205 \stackrel{?}{=} 9.42$ ✓

$a = 3 + \frac{.97405}{.49136}$

$a = 3 + 1.9824 = \boxed{4.9824}$

(10) $11^{x^2} = 25.4$

$\log 11^{x^2} = \log 25.4$

$x^2 = \dfrac{\log 25.4}{\log 11} = \dfrac{1.40483}{1.041392} = 1.348993$

$x = \pm\sqrt{1.348993} = \boxed{\pm 1.1615}$

CK $11^{(\pm 1.1615)^2} \stackrel{?}{=} 25.4$

$25.39987 \stackrel{?}{=} 25.4$ ✓

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(11) $7^{t-2} = 5^t \quad \therefore \log 7^{t-2} = \log 5^t$

$t-2 \log 7 = t \log 5$

$t-2 = \dfrac{\log 5}{\log 7} t = \dfrac{.69897}{.84510} t$

$t-2 = .82709t$

$1.00000t - .82709t = 2$

$\dfrac{.17291t}{.17291} = \dfrac{2}{.17291}$

CK $7^{11.5667-2} \stackrel{?}{=} 5^{11.5667}$ $\quad \boxed{t = 11.5667}$

$121562443 \stackrel{?}{=} 121555986$ ✓

Ch. 10-5, Base e and Natural Logarithms

e irrational number

$e \approx 2.718281828459045235360\ldots$

e fundamental (basic) constant found throughout math and science. Like π, it is calculated using infinite series.

$$e = \frac{2}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} \cdots$$ more terms = more decimals

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$2 =$ 2

$2 + \frac{1}{2} =$ 2.5

$2 + \frac{1}{2} + \frac{1}{6} =$ $2.\overline{6}\ldots$

$2 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} =$ $2.708\overline{3}\ldots$

$2 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} + \frac{1}{120} =$ $2.71\overline{6}\ldots$

$2 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} + \frac{1}{120} + \frac{1}{720} =$ $2.71805\overline{\ldots}$

$2 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} + \frac{1}{120} + \frac{1}{720} + \frac{1}{5040} = 2.71825396\overline{8}\ldots$

REF. "e THE STORY OF A NUMBER" by Eli Maor

Normally $\ln x$ means $\log_e x$

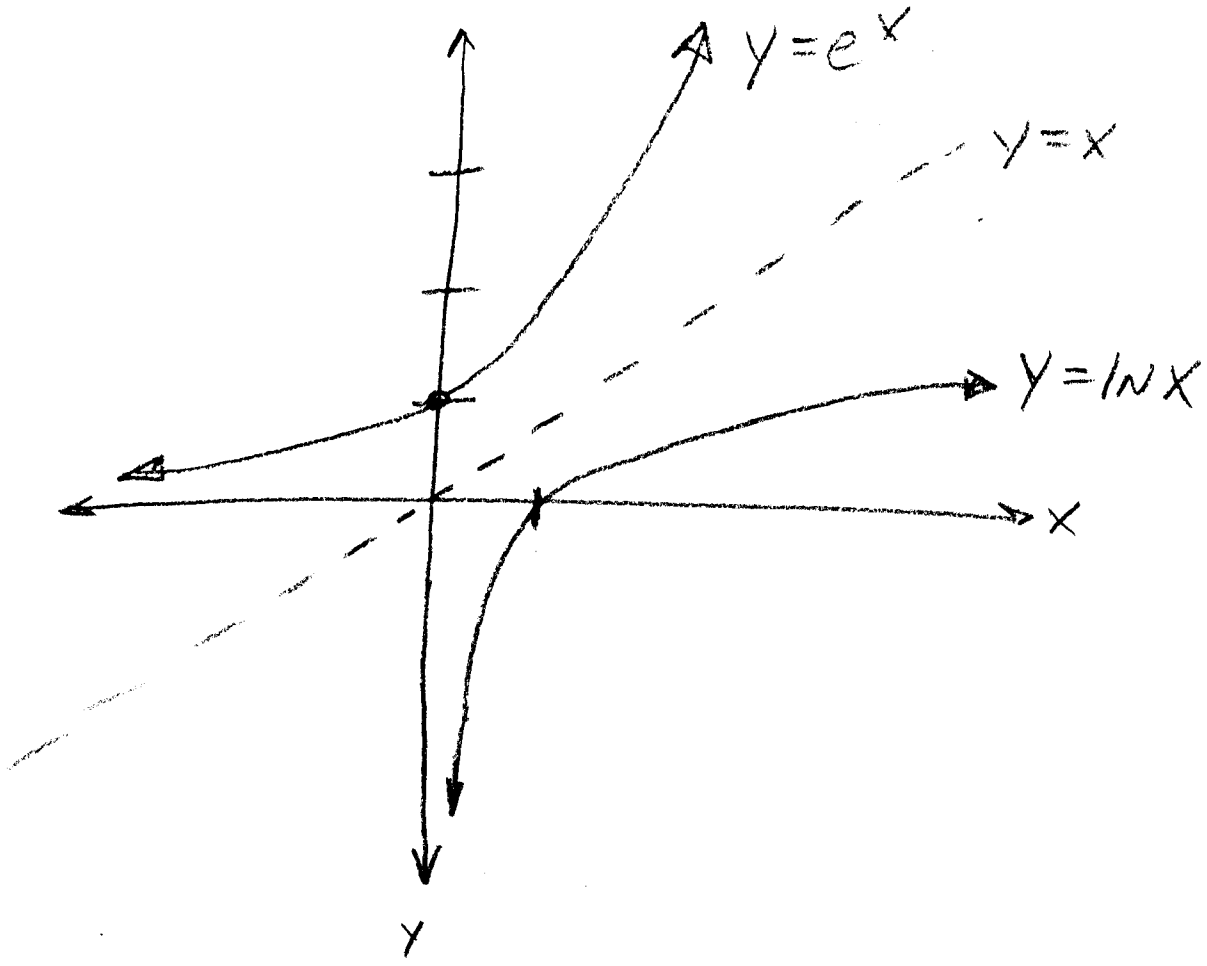
NOTE: $\ln e = ?$

$e^? = e$

$e^1 = e \quad \therefore \ln e = 1$

EXPONENTIAL $y = e^x$ growth since $e > 1$

Logarithmic $y = \ln x$ inverse function of $y = e^x$



Ex 3 Change to exponential: $e^x = 5$

Pg 555

$\log_e 5 = x$

$\therefore \boxed{\ln 5 = x}$

Change to logarithmic: $\ln x = 0.6931$

$\boxed{e^{.6931} = x}$

Ex 4 Evaluate: (A) $e^{\ln 7}$

↑ $\ln 7$ is the exponent of e that gives you 7

$\therefore$ e to this power $= 7$

$\boxed{e^{\ln 7} = 7}$

(B) $\ln e^{4x+3}$

$(4x+3)\ln e$

$(4x+3)\ 1 = \boxed{4x+3}$

If the equation you are trying to solve involves e, take "ln" of both sides, NOT "log"!

Ex 5 Solve $5e^{-x} - 7 = 2$

$$5e^{-x} = 9$$

$$e^{-x} = \frac{9}{5}$$

$$\ln e^{-x} = \ln\left(\frac{9}{5}\right)$$

$$-x = 0.587787$$

$$\boxed{x = -0.587787}$$

Ck $5e^{-(-.587787)} - 7 \stackrel{?}{=} 2$

$5e^{.587787} - 7 \stackrel{?}{=} 2$

$5(1.80000) - 7 \stackrel{?}{=} 2$

$9 - 7 \stackrel{?}{=} 2$ ✓

Ex 7 Solve $\ln 5x = 4$

$$e^4 = 5x$$

$$\frac{e^4}{5} = x$$

$$x = \frac{54.59815}{5}$$

$$\boxed{x = 10.91963}$$

Ck $\ln(5 \cdot 10.91963) \stackrel{?}{=} 4$

$3.99999 \stackrel{?}{=} 4$ ✓

Homework: Pg 557 # 4–11, 13, 16